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(54) Abstract Title
Concurrent video recording and playback

(57) A video recording device instantaneously captures stores video images displayed on a television 10. The images are preferably stored in a storage device comprising a hard disk drive 94 coupled to the television through an IEEE 1394 serial bus network. The instantaneous record operation is initiated by pressing an instantaneous record button on a remote control 16. In response, the information currently being displayed is simultaneously routed to the storage device. After storing the images, the viewer can replay the video by pressing an instantaneous playback button on the remote control. The recording device further includes the ability to record a program while concurrently playing back a previously recorded video broadcast. This previously recorded video broadcast can be the earlier recorded portion of the same program that is still recording or a different video broadcast. The viewer enters the data and commands for recording and playback preferably using the remote control. Once again, the video programs are preferably recorded and played back from the storage device. The recording device of the present invention can also be used to edit pre-recorded video. A pre-recorded video is preferably played using a conventional VCR 21 and television 10. Selected portions of the video can be recorded and stored in the storage device for later retrieval and further editing by the viewer. Preferably, the viewer initiates the edit/record operation when viewing a home video by pressing an editing record button on the remote control. The viewer can also add additional video, audio or other features.

Fig. 3

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Fig. 1

Fig. 2

Fig. 3

EXTERNAL
HDD

TO PC14   TO SETTOP BOX 11   FROM VCR 21   TO VCR 21

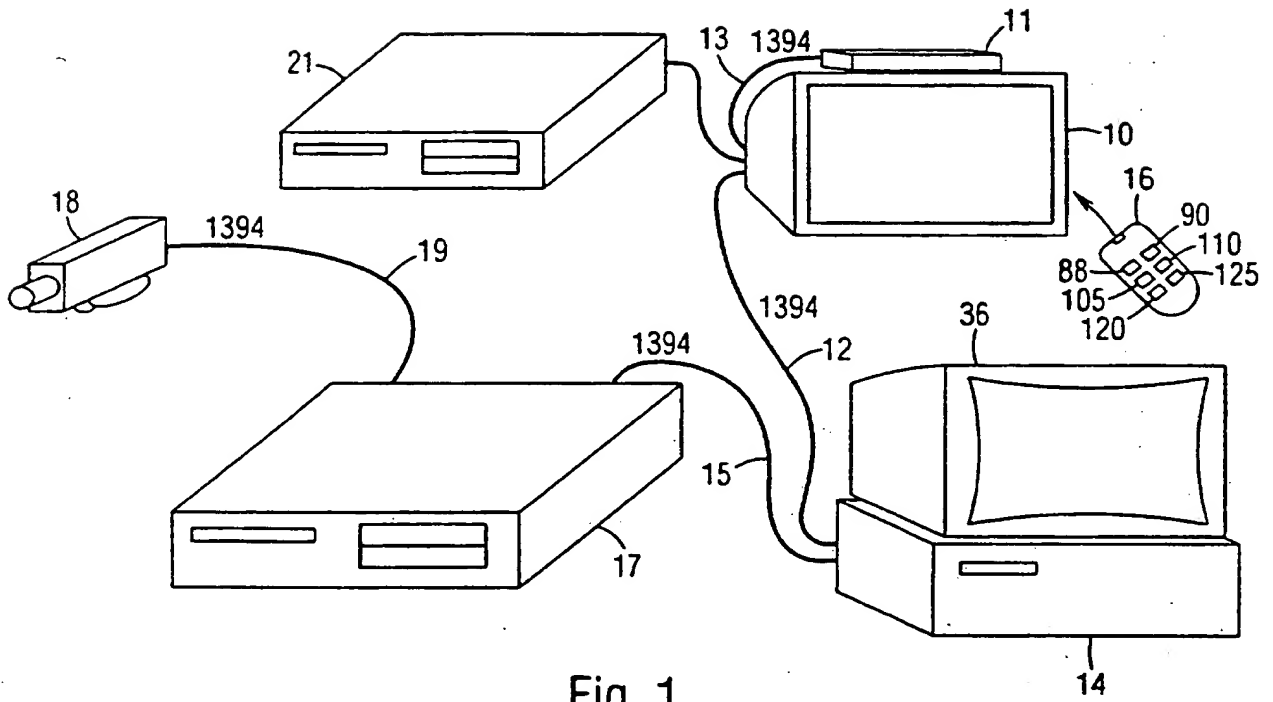12 ─╮   ╭─ 13   ╭─ ⌐   ╭─ ⌐
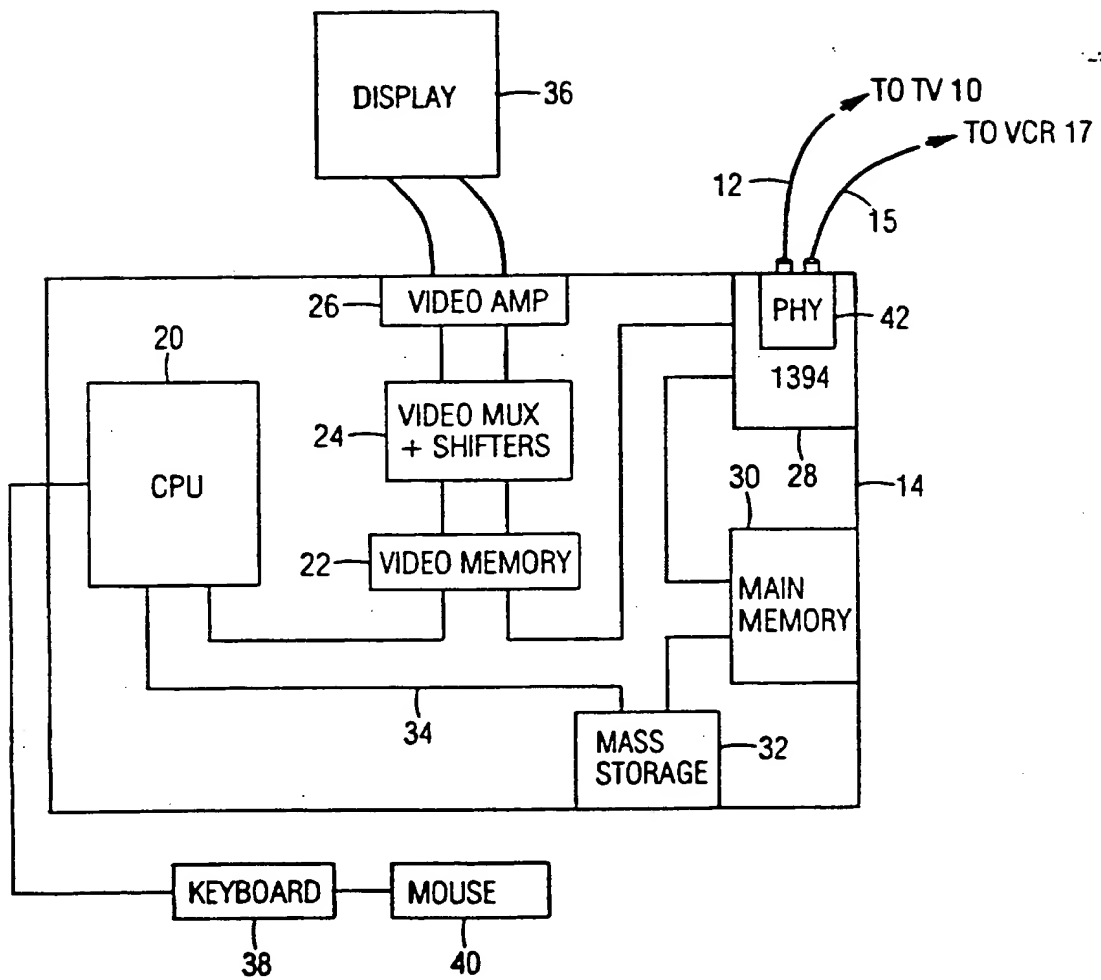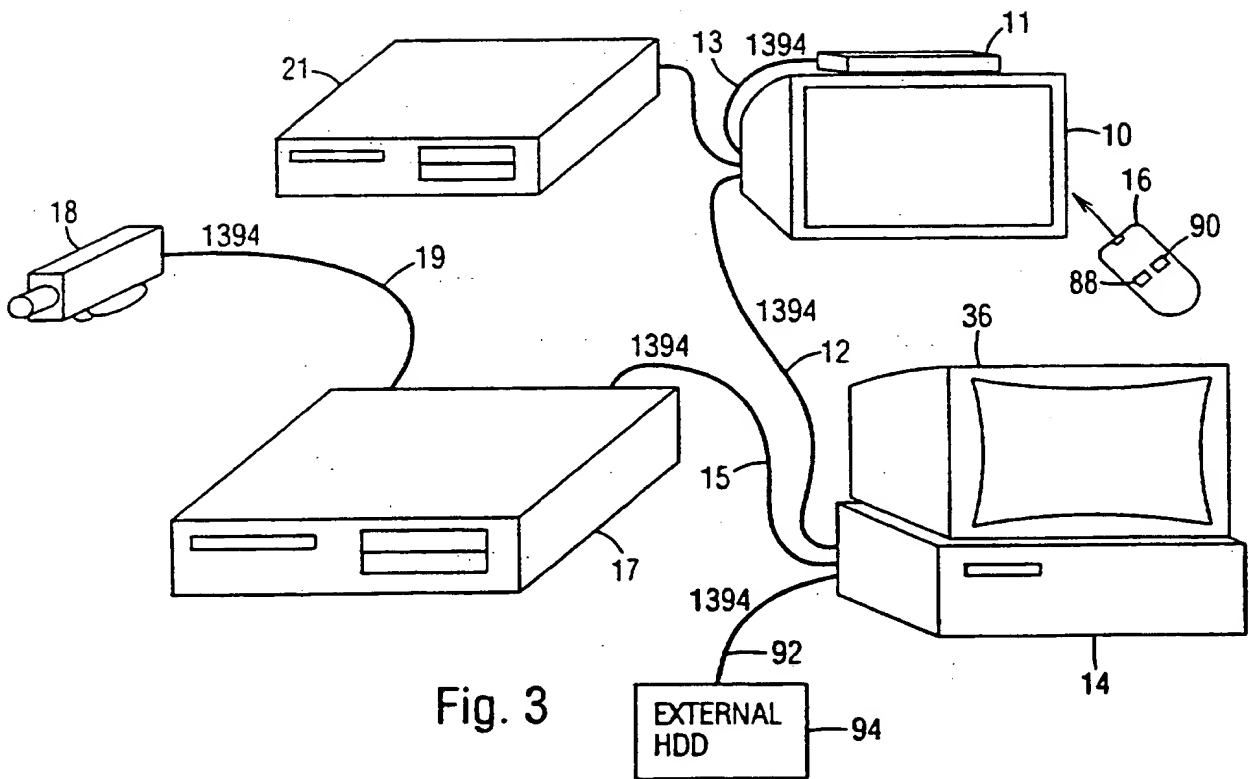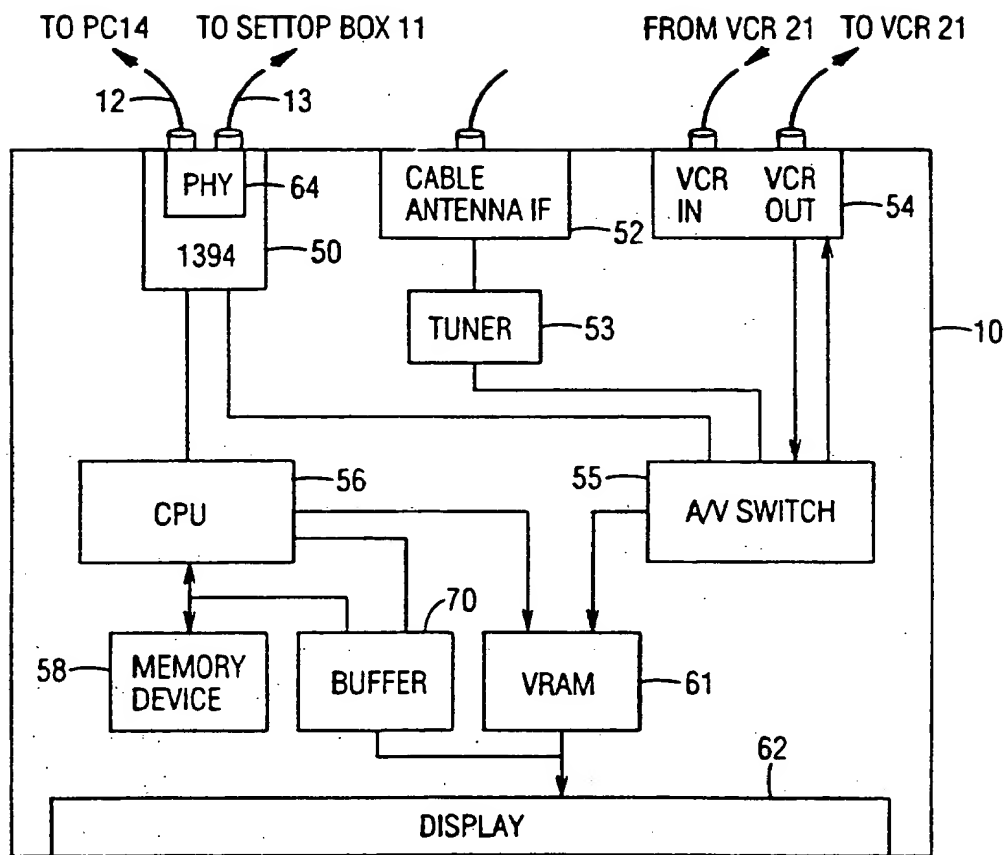

Fig. 4

A VIDEO RECORDING DEVICE INCLUDING THE
ABILITY TO CONCURRENTLY RECORD AND PLAYBACK, TO
INSTANTANEOUSLY RECORD DISPLAYED IMAGES AND
ON-THE-FLY CAPTURING AND STORING OF IMAGES FOR
5   SUBSEQUENT EDITING AND RECORDING

The present invention relates to the field of recording and replaying video images.
More particularly, the present invention relates to the field of capturing and storing video
10   images for subsequent retrieval, playing and editing.

The IEEE 1394 standard, "P1394 Standard For A High Performance Serial Bus," Draft
8.0v2. July 7, 1995, is an international standard for implementing an inexpensive high-speed
15   serial bus architecture which supports both asynchronous and isochronous format data
transfers. Isochronous data transfers are real-time transfers which take place such that the
time intervals between significant instances have the same duration at both the transmitting
and receiving applications. Each packet of data transferred isochronously is transferred in its
own time period. An example of an ideal application for the transfer of data isochronously
20   would be from a video recorder to a television set. The video recorder records images and
sounds and saves the data in discrete chunks or packets. The video recorder then transfers
each packet, representing the image and sound recorded over a limited time period, during
that time period, for display by the television set. The IEEE 1394 standard bus architecture
provides multiple channels for isochronous data transfer between applications. A six bit
25   channel number is broadcast with the data to ensure reception by the appropriate application.
This allows multiple applications to concurrently transmit isochronous data across the bus
structure. Asynchronous transfers are traditional data transfer operations which take place as
soon as possible and transfer an amount of data from a source to a destination.

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The IEEE 1394 standard provides a high-speed serial bus for interconnecting digital devices thereby providing a universal I/O connection. The IEEE 1394 standard defines a digital interface for the applications thereby eliminating the need for an application to convert digital data to analog data before it is transmitted across the bus. Correspondingly, a

5   receiving application will receive digital data from the bus, not analog data, and will therefore not be required to convert analog data to digital data. The cable required by the IEEE 1394 standard is very thin in size compared to other bulkier cables used to connect such devices. Devices can be added and removed from an IEEE 1394 bus while the bus is active. If a device is so added or removed the bus will then automatically reconfigure itself for

10   transmitting data between the then existing nodes. A node is considered a logical entity with a unique address on the bus structure. Each node provides an identification ROM, a standardized set of control registers and its own address space.

The IEEE 1394 cable environment is a network of nodes connected by point-to-point links. including a port on each node's physical connection and the cable between them. The

15   physical topology for the cable environment of an IEEE 1394 serial bus is a non-cyclic network of multiple ports, with finite branches. The primary restriction on the cable environment is that nodes must be connected together without forming any closed loops.

The IEEE 1394 cables connect ports together on different nodes. Each port includes terminators, transceivers and simple logic. A node can have multiple ports at its physical

20   connection. The cable and ports act as bus repeaters between the nodes to simulate a single logical bus. The cable physical connection at each node includes one or more ports,
,   arbitration logic, a resynchronizer and an encoder. Each of the ports provide the cable media interface into which the cable connector is connected. The arbitration logic provides access to the bus for the node. The resynchronizer takes received data-strobe encoded data bits and

25   generates data bits synchronized to a local clock for use by the applications within the node. The encoder takes either data being transmitted by the node or data received by the resynchronizer, which is addressed to another node, and encodes it in data-strobe format for transmission across the IEEE 1394 serial bus. Using these components, the cable physical

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connection translates the physical point-to-point topology of the cable environment into a virtual broadcast bus, which is expected by higher layers of the system. This is accomplished by taking all data received on one port of the physical connection, resynchronizing the data to a local clock and repeating the data out of all of the other ports from the physical connection.

5   Traditionally, viewers have been able to record and playback television broadcasts using conventional video cassette recorders (VCRs). This process of recording and playback involves programming a VCR to record a particular program and then watching the recorded program. Accordingly, the viewer will typically preset the VCR for recording in advance. However, often times when watching a television broadcast or other video program,

10   something of interest may be shown which the viewer may wish to remember - such as a telephone number. It is difficult for the viewer to write down the information in the limited amount of time that such information is typically displayed. For example, when watching a television broadcast where a telephone number or address is given out, unless the viewer has a writing utensil and paper readily available, it is difficult to get the pencil and paper to write

15   down the information while it is still being displayed. While a viewer could use a conventional VCR to record the program, such is often not possible as the VCR may not be set up to record when the information is displayed. Furthermore. it is difficult to initiate recording at the same time the information is displayed, due to the mechanical latency inherent in conventional video recorders. Accordingly, what is needed is an apparatus for

20   recording such video information, while it is being displayed within a television broadcast or other video program, which does not have the inherent mechanical latency associated with traditional video recording devices.

A conventional video cassette recorder (VCR) allows a user to record video broadcasts from a television broadcast signal or other video signal input to the VCR. When recording a

25   video broadcast on a conventional VCR a user must wait until the VCR is finished recording the broadcast before viewing the beginning of the broadcast. For example, a user who comes home during the middle of the recording of a television broadcast cannot start watching the recording of the television broadcast from the beginning until that recording is finished. In

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order to start watching the beginning of the recording, the user would have to stop the recording and would then lose the ability to record and watch the end of the broadcast. A conventional VCR will not allow a viewer to watch the beginning of a recorded television broadcast while concurrently recording the ending of the television broadcast.

5   Correspondingly, a conventional VCR will not allow one program to be recorded while concurrently playing back a previously recorded program. What is needed is an apparatus which will allow a user to time-shift a recording of a video broadcast in order to view the broadcast from the beginning while concurrently recording the remainder of the video broadcast. What is further needed is an apparatus which will also allow a user to record one

10   video program while concurrently playing back a second video program.

For a consumer taking home videos on a video camera there is a lack of easy to use video editing systems which allow the consumer to edit their home videos. When taking - home videos, it is desirable to have the ability to edit those videos and save the highlights of the recording for future viewing. It is also desirable to have the ability to add video, audio or

15   special effects to the edited home videos. While many consumer editing systems exist, such systems are typically time consuming both to learn and to use. What is needed is a video editing system which is easy to learn and use.

20   A video recording device captures and stores video images currently being displayed on a television or other video viewing device. The video images are preferably stored in a memory storage device for later retrieval by the viewer. Preferably, the memory storage device is a hard disk drive coupled to the television through an IEEE 1394 serial bus network. Alternatively, the memory storage device is included within the television for storing the

25   image or series of images. In a further alternate embodiment, both video information and accompanying audio information are stored in response to the viewer's command to instantaneously record.

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Preferably, the viewer initiates the instantaneous record operation by pressing an instantaneous record button on a remote control device. In response to an instantaneous record signal from the remote control device, the television will then initiate the recording of the information currently being displayed by concurrently routing the information to the

5   memory storage device while it is being displayed. After storing the information, the viewer can then subsequently replay the information by pressing an instantaneous playback button on the remote control device. When the viewer presses the instantaneous playback button, the television will retrieve the stored information from the memory storage device and display it for the viewer.

10   The video recording device further includes the ability to record a video broadcast or video program while concurrently replaying a previously recorded video broadcast. This previously recorded video broadcast can be the same video broadcast that is recording or a different video broadcast. The record and playback operations are preferably triggered and controlled through the television on which the user can watch the playback of the recorded

15   program. The viewer enters the data and commands for recording and playback preferably using the remote control device. The video programs are preferably recorded on the memory storage device. The television uses write commands to transmit and record the program onto the memory storage device and read commands to retrieve previously recorded portions of a program to be replayed from the memory storage device. When playing back a previously

20   recorded program or the recorded portions of a program which is still being recorded, the television will retrieve the packets of data from the memory storage device in sequence, using read commands to read from the appropriate locations where the appropriate packets have been stored. Each packet is then retrieved in sequence from the beginning of the program, even if the end portion of the program is still being recorded.

25   The video recording device of the present invention captures and stores selected video images currently being displayed on the television or other video viewing device the accompanying audio information. Selected portions of the video images being displayed on the television, and the accompanying audio information are preferably stored in the memory

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storage device for later retrieval and further editing by the viewer. Preferably, the viewer initiates the record operation when viewing a video stream by pressing an editing record button on the remote control device. In response to an editing record signal from the remote control device, the television will then initiate the recording of the information currently being displayed by routing the information to the memory storage device. After storing the information, the viewer can then subsequently replay the information by pressing an editing playback button on the remote control device. When the viewer presses the playback button, the television will preferably retrieve the last segment of stored information from the memory storage device and display it for the viewer. Alternatively, if more than one segment has been stored and not viewed, the segments are retrieved in succession beginning with the first segment of stored information which has not yet been played. The viewer can then further edit the stored information and add additional video, audio or other features to the stored information. When fully edited, the viewer can preview and then save the stored video information onto a video tape by transferring the stored video information from the memory storage device to an appropriate recording device coupled to the memory storage device for recording.

Preferably, the instantaneous record, editing record, instantaneous playback and editing playback are separate buttons on the remote control device. Alternatively, the instantaneous record and editing record buttons are combined into a single special record button and the instantaneous playback and editing playback buttons are combined into a single special playback button. In still a further alternate embodiment, the remote control device can have only instantaneous record and playback buttons or editing record and playback buttons, depending on the capabilities of the system.

The present invention will be more clearly understood from the following description, given by way of example only, with reference to the accompanying drawings in which:

Figure 1 illustrates a block diagram of an IEEE 1394 serial bus network including a computer system, a video cassette recorder (VCR), a video camera and a television.

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Figure 2 illustrates a block diagram of the internal components of the computer system.

Figure 3 illustrates a block diagram of an IEEE 1394 serial bus network including a computer system, a VCR, a video camera, a television and an external hard disk drive.

5   Figure 4 illustrates a block diagram of components within a television of an alternate embodiment of the present invention.

A video recording device will instantaneously capture and store a video image or
10   series of video images from a television or other video viewing device at the command of a viewer. The image or series of images are stored in a memory storage device. Preferably, the memory storage device is a hard disk drive coupled to the television through an IEEE 1394 serial bus network. This hard disk drive is either resident within a computer system coupled to the television or the hard disk drive is an external hard disk drive coupled to the
15   television. Alternatively, the memory storage device is included within the television for storing the image or series of images. In a further alternate embodiment, any appropriate memory device is used to store the image or series of images, including a random access memory (RAM) or a flash memory device.

The instantaneous record operation is triggered by a viewer using a remote control
20   device when something of interest is being displayed on the television. The viewer pushes an instantaneous record button on the remote control device to instruct the television to initiate recording of the video image currently being displayed. The television then routes the information representing the video image to the memory storage device. After storing the information, the viewer can then subsequently replay the information. In an alternate
25   embodiment of the present invention, the video information and accompanying audio information are both captured and stored in this manner. Because the information is preferably sent over the IEEE 1394 serial bus network, the information is instantaneously transmitted and stored in a digital format.

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The video recording device of the present invention includes the ability to record a video broadcast while concurrently replaying a previously recorded portion of a video broadcast. This video broadcast being replayed can be the same video broadcast that is recording or a different video broadcast which has been previously recorded. When recording
5   a video broadcast or program, the recording of the program is completed in sequence, each recorded packet of data representing the video broadcast during a specific portion of time. As described above, when recording on a conventional VCR the user cannot watch the recording from the beginning, while still recording the end portion of the program. Both the recording and replaying operations take place at real time speeds.
10   The video recording apparatus of the present invention will allow a user to watch a previously recorded portion of a program while still recording the remaining portion of the program. For example, for a user desiring to watch the beginning of a thirty minute program which is being recorded and is only half complete, the video recording device of the present invention will continue to record the program for the second fifteen minutes while allowing
15   the user to watch the program from the beginning. When the user begins watching the program, the apparatus will continue to record the program in sequence, so that there will be a constant time difference between the portion of the program being viewed by the user and the portion of the program being recorded. Once the program is finished recording, the user can continue to view the program in sequence until the user has viewed the entire program.
20   The user also has the ability to fast forward and rewind through the already recorded portion of the program while the remainder of the program is recorded. The user can also record one video broadcast while concurrently watching another previously recorded video broadcast. The concurrency of these operations is aided by the IEEE 1394 serial bus network. This bus protocol operates sufficiently fast that both the record and playback operations can occur
25   concurrently, for example within a same video time period, and appear real time to a user. Thus, no data or signal is lost.

The record operation is programmed by a viewer using a remote control device to enter the relevant control data such as the program starting time, ending time and the channel

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or source of the program. Beginning at the starting time, the television then sends the video data for the program to the memory or mass storage device for storing. The television will use write operations to send the program to the mass storage device in packets for storing the data at a known location within the mass storage device. Each packet of data represents the program during a specific portion of time. The viewer can then replay recorded programs and recorded portions of programs using the remote control device to instruct the television to replay the specified program. When playing back a previously recorded program or the recorded portions of a program which is still being recorded, the television will retrieve the packets of data from the mass storage device in sequence, using read commands to read from the appropriate locations where the appropriate packets have been stored. Each packet is then retrieved in sequence from the beginning of the program, even if the end portion of the program is still being recorded. If the end portion of the program is still being recorded, the television will send the packets of data representing the video program to the mass storage device, while also reading the appropriate packets for playback from the mass storage device. Accordingly, the apparatus of the present invention will record a video program while also allowing a user to replay a previously recorded program or the previously recorded portions of the same video program.

The record and playback operations are preferably triggered and controlled through a television on which the user can watch the playback of a recorded program. The viewer enters the data and commands for recording a television broadcast or other program preferably using a remote control device. The viewer also enters the playback command preferably using the remote control device. The video program is recorded on a memory storage device or other appropriately configured memory device. Preferably, the memory storage device is a hard disk drive coupled to the television through an IEEE 1394 serial bus network. This hard disk drive is either resident within a computer system coupled to the television or the hard disk drive is an external hard disk drive coupled to the television. Alternatively, the memory storage device is included within the television for recording the program.

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The video recording device of the present invention can also be used to capture and store a video image or series of video images and accompanying audio information currently being displayed on a television or other video viewing device at the command of a viewer. The video recording and editing device of the present invention is used to capture and store

5   selected portions of the video images, and accompanying audio information, currently being displayed on the television or other video viewing device. The selected portions, and the accompanying audio information, are stored in the memory storage device.

The record operation is triggered by a viewer using the remote control device when the viewer desires to save the image and audio being displayed on the television. The viewer

10   pushes an editing record button on the remote control device to instruct the television to initiate recording of the information currently being displayed. The television then routes the information currently being displayed to the memory storage device. Preferably, video images and accompanying audio information are selected and stored as long as the editing record button is pressed. In an alternate embodiment, the video images and accompanying audio

15   information are selected and stored from the time the editing record button is first pressed until the editing record button is pressed a second time. After storing the information, the viewer can then subsequently replay the information for further editing, if necessary. Because the information is preferably sent over the IEEE 1394 serial bus network, the information is transmitted and stored in a digital format. Once the video information is fully edited, the

20   viewer can replay the selected portions of the video information. The viewer can also save the edited video information onto a video tape by transferring the stored video information from the memory storage device to a VCR, video camera or other appropriate recording device coupled to the memory storage device, for recording.

A block diagram of an exemplary IEEE 1394 serial bus network including a computer

25   system, a VCR, a video camera and a television, is illustrated in Figure 1. The invention is not limited to a system such as that shown in Figure 1; other components can be added or certain components can be removed and still achieve the advantages of the present invention. A computer system 14 includes an associated display 36 and is coupled to the television 10.

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by an IEEE 1394 serial bus cable 12. A settop box 11 is coupled to the television 10 by an IEEE 1394 serial bus cable 13. A VCR 17 is coupled to the computer system 14 by an IEEE 1394 serial bus cable 15. A video camera 18 is coupled to the VCR 17 by an IEEE 1394 serial bus cable 19. Together, the settop box 11, the television 10, the computer system 14,

5   the VCR 17 and the video camera 18 form an IEEE 1394 serial bus network. A second VCR 21 is coupled to the television 10 through a traditional VCR interface circuit and is not part of the IEEE 1394 serial bus network.

    · A wireless cursor control/input device 16 provides input and control signals to the television 10. The wireless cursor control/input device 16 includes an instantaneous record

10   button 88. an instantaneous playback button 90, an editing record button 120. an editing playback button 125. a video record button 105 and video playback button 110. The wireless cursor control/input device 16 also includes other input and control buttons typically associated with such devices, including but not limited to pause. fast forward and rewind buttons. The wireless cursor control/input device 16 preferably communicates with the

15   television 10 using infrared signals. Alternatively, any other suitable cursor control/input device can be substituted for the device 16, including but not limited to a wired input device. a radio frequency input device and a wired or wireless keyboard with integral cursor control device.

    A block diagram of the internal components of the computer system 14 is illustrated in

20   Figure 2. The computer system 14 includes a central processor unit (CPU) 20, a main memory 30. a video memory 22, a memory storage device 32 and an IEEE 1394 interface circuit 28, all coupled together by a conventional bidirectional system bus 34. The interface circuit 28 includes the physical interface circuit 42 for sending and receiving communications on the IEEE 1394 serial bus. The physical interface circuit 42 is coupled to the television 10

25   and to the VCR 17, over the IEEE 1394 serial bus cables 12 and 15, respectively. In the preferred embodiment of the present invention, the interface circuit 28 is implemented on an IEEE interface card within the computer system 14. However, it should be apparent to those skilled in the art that the interface circuit 28 can be implemented within the computer system

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14 in any other appropriate manner, including building the interface circuit onto the motherboard itself. The memory storage device 32 may include both fixed and removable media using any one or more of magnetic, optical or magneto-optical storage technology or any other available memory storage technology. The system bus 34 contains an address bus

5   for addressing any portion of the memory 22 and 30. The system bus 34 also includes a data bus for transferring data between and among the CPU 20, the main memory 30, the video memory 22, the memory storage device 32 and the interface circuit 28.

The computer system 14 is also coupled to a number of peripheral input and output devices including the keyboard 38, the mouse 40 and the associated display 36. The keyboard

10   38 is coupled to the CPU 20 for allowing a user to input data and control commands into the computer system 14. A conventional mouse 40 is coupled to the keyboard 38 for manipulating graphic images on the display 36 as a cursor control device.

A port of the video memory 22 is coupled to a video multiplex and shifter circuit 24, which in turn is coupled to a video amplifier 26. The video amplifier 26 drives the display

15   36. The video multiplex and shifter circuitry 24 and the video amplifier 26 convert pixel data stored in the video memory 22 to raster signals suitable for use by the display 36.

When a viewer, watching a program on the television 10 (Figure 1), pushes the instantaneous record button 88, the video information representing the picture currently being displayed on the television is instantly transferred from the television 10 (Figure 1) to the

20   computer system 14 (Figure 2) over the IEEE 1394 serial bus network for recording on the memory storage device 32 (Figure 2). In the preferred embodiment of the present invention, by pressing the instantaneous record button 88 (Figure 1) and instantaneously releasing the button, only the current frame of video displayed is transmitted to and recorded on the memory storage device 32 (Figure 2). However, if the viewer presses and holds down the

25   instantaneous record button 88 (Figure 1), the video information for the frames displayed during the time period that the button 88 (Figure 1) is depressed will be transmitted to the computer system 14 over the IEEE 1394 serial bus network for recording on the memory storage device 32 (Figure 2). In an alternate embodiment of the present invention. both the

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video information and the accompanying audio information are transmitted by the television 10 (Figure 1) to the computer system 14 (Figure 2) for storing within the memory storage device 32 (Figure 2), when the instantaneous record button 88 is depressed.

Any type of video information which is displayed on the television 10 (Figure 1) can be stored in this manner. The television 10 (Figure 1) will display video information from a number of sources including the settop box 11 (Figure 1), the VCR 17 (Figure 1) and the video camera 18 (Figure 1), over the IEEE 1394 serial bus network, and also the VCR 21 (Figure 1). Video information from any of these sources, which is displayed on the television 10 (Figure 1) can be instantaneously captured using the instantaneous record button 88 (Figure 1) and stored within the memory storage memory device 32 (Figure 2).

Once the video information is stored, the viewer can then retrieve the information by depressing the instantaneous playback button 90 (Figure 1). When the instantaneous playback button 90 (Figure 1) is depressed, the television 10 (Figure 1) will preferably retrieve the video information segment last stored using the instantaneous record button 88 (Figure 1). Alternatively, if more than one video information segment has been stored and not played back. then when the instantaneous playback button 90 (Figure 1) is depressed, the television 10 (Figure 1) will retrieve the stored video information segments in succession, beginning with the first stored video information segment. In a further alternate embodiment, two playback buttons are included, a first playback button to access the last stored video information segment and a second playback button to access all previously unviewed stored video information segments, in succession. Once the viewer is in playback mode, the pause, next frame, previous frame, fast forward and rewind functions can be used to access all stored video information segments.

The retrieval of stored video information segments is accomplished by a read operation to the address within the memory storage device 32 (Figure 2) where the information was stored. The memory storage device 32 (Figure 2) will then retrieve that information and the computer system 14 (Figure 2) will transmit the information to the television 10 (Figure 1)

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over the IEEE 1394 serial bus network. The television 10 (Figure 1) will then display the information for the viewer. If more than one frame of video information was captured in the video information segment, the viewer can also use the pause, next frame, previous frame, fast forward and rewind functions when viewing the information.

5   Within the preferred embodiment of the present invention, the video information to be instantaneously recorded is transmitted from the television 10 (Figure 1) to a memory storage device, as described above. While the memory storage device 32 (Figure 2) within the computer system 14 (Figure 2) can be used to store this information, it is also possible to use another memory storage device coupled to or within the television 10 (Figure 1). A block

10   diagram of an exemplary IEEE 1394 serial bus network including an external hard disk drive is illustrated in Figure 3. Where appropriate, the same reference numerals are used in Figure 3 as in Figure 1. This IEEE 1394 serial bus network includes the devices of Figure 1 and the external hard disk drive 94 which is coupled to the computer system 14 by the IEEE 1394 serial bus cable 92.

15   In the network illustrated in Figure 3, packets of data within a program to be recorded are transmitted from the television 10 to the external hard disk drive 94 over the IEEE 1394 serial bus network. The external hard disk drive 94 will then store that video information for later retrieval and playback.

        In still a further alternative embodiment, the television 10 includes a memory device

20   which will store video information to be instantaneously recorded. A block diagram of components within this embodiment of the television 10 is illustrated in Figure 4. An IEEE 1394 interface circuit 50 includes a physical interface circuit 64. The physical interface circuit 64 is coupled to the PC 14 and to the settop box 11, over the IEEE 1394 serial bus cables 12 and 13, respectively. The IEEE 1394 interface circuit 50 is coupled to a CPU 56

25   for controlling communications between the CPU 56 and devices coupled to the IEEE 1394 serial bus network. The IEEE 1394 interface circuit 50 is also coupled to an audio/video switch 55 for providing video signals from the devices coupled to the IEEE 1394 serial bus network. A cable/antenna interface circuit 52 is coupled to receive input signals from a

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coaxial cable or an antenna and to pass those signals through a tuner 53 to an audio/video switch 55. A traditional VCR interface circuit 54 is coupled to receive input signals from the VCR 21 and to output signals to the VCR 21. The VCR interface circuit 54 is also coupled to the audio/video switch 55 for directing audio/video signals to and from the VCR 21.

5   A memory device 58 is coupled to the CPU 56 for storing information. The audio/video switch 55 and the CPU 56 are coupled to the video random access memory (VRAM) circuit 61 for providing video input signals to the VRAM circuit 61 from the multiple sources. The VRAM circuit 61 provides the video signals to the display 62. If a compressed video stream of data is received by the television 10, that stream of data is

10   decompressed before being sent to the VRAM circuit 61 by a coder/decoder circuit (CODEC) or other appropriate decompression engine, within the television 10. The VRAM circuit 61 is also coupled to a buffer 70 for providing the video signals to the buffer 70. The buffer 70 is also coupled to the memory device 58 and to the CPU 56. Each frame of video information is loaded in the buffer 70 as it is transmitted to the display 62. If the instantaneous record

15   button 88 is pressed, the CPU 56 then sends a command to the buffer 70 to output the video information to the memory device 58. Otherwise the video information for the next frame is stored within the buffer 70.

Using the television 10, illustrated in Figure 4, when the viewer presses the instantaneous record button 88 to record video information being displayed on the television

20   10, that video information is transmitted to and stored within the memory device 58. When the instantaneous playback button 90 is then pressed, the television 10 will read the information from the memory device 58 and display it on the display 62 for the viewer.

The apparatus of the present invention can also be used to simultaneously record and play video programs. A video record operation is programmed using the remote control

25   device 16 (Figure 1) to enter the relevant control data such as the program starting time, ending time and the channel or source of the program. This information is stored within a memory in the television 10 (Figure 1). At the program starting time, the television 10 (Figure 1) will begin transmitting packets of data representing the program, to the memory

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storage device 32 (Figure 2) within the computer 14 (Figure 2). These packets of data are transmitted over the IEEE 1394 serial bus network and then stored on the memory storage device 32 (Figure 2). Preferably, an isochronous recording channel is established over the IEEE 1394 serial bus network between the television 10 (Figure 1) and the computer system 5   14 (Figure 2) for the transmission of the packets to be stored.

A viewer can playback a stored program using the video playback button 110 (Figure 1) on the remote control device 16 (Figure 1) to instruct the television 10 (Figure 1) to begin playing the program. When receiving a playback command, the television 10 (Figure 1) will retrieve the packets of data in sequence, from the memory storage device 32 (Figure 2), using 10   read commands to read the packets of data from the appropriate locations in the memory storage device 32 (Figure 2). The packets of data are then transmitted from the memory storage device 32 (Figure 2) to the television 10 (Figure 1). Preferably, an isochronous channel is established over the IEEE 1394 serial bus network, between the computer system 14 (Figure 2) and the television 10 (Figure 1) for the transmission of the packets from the 15   memory storage device 32 (Figure 2) to the television 10 (Figure 1).

Once the television receives the packets of data from the memory storage device 32 (Figure 2), the video and audio information represented by the packet of data is displayed by the television 10 (Figure 1). When the television 10 (Figure 1) is recording and playing back portions of the same program or portions of two different programs, a packet of data is 20   transmitted to and from the memory storage device 32 (Figure 2) during each time period. In this manner, one packet of data is stored from the program being recorded and one packet of data is retrieved for the program being replayed during each time period.

Any type of video information which can be displayed on the television 10 (Figure 1) can be stored and played back in this manner. The television 10 (Figure 1) will display video 25   information from a number of sources including the settop box 11 (Figure 1), the VCR 17 (Figure 1) and the video camera 18 (Figure 1), over the IEEE 1394 serial bus network, and also the VCR 21 (Figure 1). Video information from any of these sources, which is displayed

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on the television 10 (Figure 1) can be stored within the memory storage memory device 32 (Figure 2).

Once a video program or portions of a video program are stored, the viewer can then retrieve the information by depressing the video playback button 110 (Figure 1). When the video playback button 110 (Figure 1) is depressed, the television 10 (Figure 1) will retrieve the appropriate packets from the memory storage device 32 (Figure 2). This retrieval is accomplished by a read operation to the address within the memory storage device 32 (Figure 2) where the information was stored. The memory storage device 32 (Figure 2) will then retrieve that information and the computer system 14 (Figure 2) will transmit the information to the television 10 (Figure 1) over the IEEE 1394 serial bus network. The television 10 (Figure 1) then displays the information for the viewer. The viewer can also use the pause. next frame. previous frame. fast forward and rewind functions when viewing and editing prerecorded packets of video information.

The viewer can also save a program or portions of a program by recording the program on a tape in another available recording device, such as the video camera 18 (Figure 1) or the VCR 17 (Figure 1). To record a program saved on the memory storage device 32 (Figure 2) to a tape. the appropriate packets of information are transmitted from the memory storage device 32 (Figure 2) to the selected recording device over the IEEE 1394 serial bus network.

The video recording device of the present invention records video programs on a memory storage device for later retrieval and playback. As described, the memory storage device is preferably a hard disk drive coupled to the television through an IEEE 1394 serial bus network. This hard disk drive is either resident within a computer system coupled to the television or the hard disk drive is an external hard disk drive coupled to the television. Alternatively, the memory storage device is included within the television for storing the video programs.

Additionally, the present invention can be used to playback and edit pre-recorded home videos. After recording a home video using a conventional video camera such as the

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camera 18 (Figure 1), a viewer can use the recording and editing device of the present invention to edit the video by re-recording selected portions of the videos. To edit the video stream, the viewer causes the recorded stream to be displayed on the television 10 (Figure 1), by instructing the video camera 18 (Figure 1) to transmit the recorded video stream to the

5   television 10 (Figure 1). While the recorded video stream is displayed on the television 10 (Figure 1), the viewer can then edit the video stream using the editing record button 120 (Figure 1) on the wireless cursor control/input device 16 (Figure 1). When a viewer, watching a video stream currently displayed on the television 10 (Figure 1), pushes the editing record button 120 (Figure 1), the video information and accompanying audio information

10   representing the information currently being displayed on the television is transferred from the television 10 (Figure 1) to the computer system 14 (Figure 2) over the IEEE 1394 serial bus network for recording on the memory storage device 32 (Figure 2). In this manner, while viewing a video stream, a user can select portions of the video stream which are to be saved for further editing and re-recording.

15   In the preferred embodiment of the present invention, video images and accompanying audio information are selected and stored as long as the editing record button 120 (Figure 1) is pressed. In an alternate embodiment, the video images and accompanying audio information are selected and stored from the time the editing record button 120 (Figure 1) is first pressed. until the editing record button 120 (Figure 1) is pressed a second time. The

20   video images and accompanying audio information selected by the viewer using the editing record button 120 (Figure 1) are preferably transmitted to the computer system 14 (Figure 2) over the IEEE 1394 serial bus network for recording on the memory storage device 32 (Figure 2).

         Any type of video information which is displayed on the television 10 (Figure 1) can

25   be stored and edited in this manner. The television 10 (Figure 1) will display video information from a number of sources including the settop box 11 (Figure 1), the VCR 17 (Figure 1) and the video camera 18 (Figure 1), over the IEEE 1394 serial bus network, and also the VCR 21 (Figure 1). Video information from any of these sources, which is displayed

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on the television 10 (Figure 1) can be captured using the editing record button 120 (Figure 1) and stored within the memory storage device 32 (Figure 2).

Once video information is selected and stored using the editing record button 120, the viewer can then retrieve the information by pressing the editing playback button 125 (Figure 1). When the editing playback button 125 (Figure 1) is pressed, the television 10 (Figure 1) will preferably retrieve the video information segment last stored. Alternatively, if more than one video information segment has been stored and not retrieved, the television 10 (Figure 1) will retrieve the stored video information segments in succession, beginning with the first stored video information segment. In a further alternate embodiment, two editing playback buttons are included, a first editing playback button to access the last stored video information segment and a second editing playback button to access all previously unviewed, stored video information segments, in succession. Once the viewer is in playback mode, the pause, next frame, previous frame, fast forward and rewind functions can be used to access all stored video information segments.

The retrieval of stored video information segments is accomplished by a read operation to the address within the memory storage device 32 (Figure 2) where the information was stored. The memory storage device 32 (Figure 2) will then retrieve that information and the computer system 14 (Figure 2) will transmit the information to the television 10 (Figure 1) over the IEEE 1394 serial bus network. The television 10 (Figure 1) then displays the information for the viewer. The viewer can also use the pause, next frame, previous frame, fast forward and rewind functions when viewing and editing the information. The viewer can further edit the information using any available features including adding video and audio from another source, adding special effects and adding minimal video transitions, such as fading and cross-dissolve.

Once finally edited, the viewer can then save the information by recording it to a tape in an available recording device, such as the video camera 18 (Figure 1) or the VCR 17 (Figure 1). To record the finally edited information on a tape, the information is transmitted from the memory storage device 32 (Figure 2) to the selected recording device over the IEEE

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1394 serial bus network. In the manner as described, recorded videos or other video streams can be edited and re-recorded in an easy and efficient manner.

Preferably, the instantaneous record button 88, editing record button 120, instantaneous playback button 90 and editing playback button 125 are separate buttons on the remote control device, as illustrated in Figure 1. Alternatively, the instantaneous record and editing record functions are combined into a single special record button and the instantaneous playback and editing playback functions are combined into a single special playback button. In still a further alternate embodiment, the remote control device has only instantaneous record and playback buttons or editing record and playback buttons, depending on the capabilities of the system.

The present invention has been described in terms of specific embodiments incorporating details to facilitate the understanding of principles of construction and operation of the invention. Such reference herein to specific embodiments and details thereof is not intended to limit the scope of the claims appended hereto. It will be apparent to those skilled in the art that modifications may be made in the embodiment chosen for illustration without departing from the spirit and scope of the invention. Specifically, it will be apparent to those skilled in the art that while the preferred embodiment of the present invention is used with an IEEE 1394 serial bus structure, the present invention could also be implemented on any other appropriate bus structures.

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CLAIMS

1.   A method of instantaneously capturing video images comprising the steps of:

    a.   receiving a record instruction to instantaneously record video information currently being displayed;

    b.   transmitting the video information currently being displayed to a memory storage device; and

    c.   storing the video information within the memory storage device.

2.   The method as claimed in claim 1 wherein the video information is transmitted in a digital format.

3.   The method as claimed in claim 1 further comprising the steps of:

    a.   receiving a playback instruction to playback previously stored video information;

    b.   retrieving the video information from the memory storage device; and

    c.   displaying the video information.

4.   The method as claimed in claim 3 wherein the record and playback instructions are received from a remote control device.

5.   The method as claimed in claim 4 wherein the video information includes corresponding audio information.

6.   The method as claimed in claim 5 wherein the memory storage device is a hard disk drive.

1   7.   The method as claimed in claim 6 wherein the video information is transmitted

2   and recorded in a digital format.

1   8.   An apparatus for instantaneously capturing video images comprising:

2   a.   a display for displaying video information;

3   b.   a transmitting circuit coupled to receive the video information for transmitting

4   the video information when a record command is received;

5   c.   a memory device coupled to the transmitting circuit for receiving and storing

6   the video information transmitted from the transmitting circuit: and

7   d.   means for controlling the memory device to store video data which is currently

8   being displayed with no lag latency.

1   9.   The apparatus as claimed in claim 8 further comprising a receiving circuit

2   coupled to the memory device and to the display for retrieving the video information from the

3   memory device when a playback command is received, and sending the video information to

4   the display.

1   10.   The apparatus as claimed in claim 9 wherein the record and playback

2   commands are received from an input device.

1   11.   The apparatus as claimed in claim 10 wherein the input device is a wireless

2   , remote control device.

1   12.   The apparatus as claimed in claim 9 wherein the video information includes

2   corresponding audio information.

1   13.   The apparatus as claimed in claim 9 wherein the memory device and the

2   display are included within a television.

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1   14.   The apparatus as claimed in claim 9 wherein the memory device is a hard disk
2   drive.

1   15.   The apparatus as claimed in claim 14 wherein the hard disk drive is included
2   within a computer system.

1   16.   The apparatus as claimed in claim 15 wherein the transmitting and receiving
2   circuits are coupled to the memory device by an IEEE 1394 serial bus network.

1   17.   The apparatus as claimed in claim 16 wherein the video information is
2   transmitted and recorded in a digital format.

1   18.   A television for displaying video information and capturing and storing video
2   information currently being displayed comprising:
3   a.   a display for displaying video information;
4   b.   a capturing circuit for capturing video information currently being displayed
5   when a record command is received;
6   c.   a communications circuit coupled to the capturing circuit and configured for
7   coupling to a memory device for transmitting the video information to the
8   memory device for storing within the memory device and subsequently
9   receiving the video information from the memory device when a playback
10   command is received; and
11   d.   means for controlling the memory device to store video data which is currently
12   being displayed with no lag latency.

1   19.   The television as claimed in claim 18 wherein the memory device is external to
2   the television and the communications circuit is configured for coupling to the memory device
3   through an IEEE 1394 serial bus network.

1   20.   The television as claimed in claim 19 wherein the video information is
2   transmitted and recorded in a digital format.

1   21.   The television as claimed in claim 18 wherein the memory device   is internal
2   to the television.

1   22.   The television as claimed in claim 18 further comprising an input device for
2   sending the record and playback commands.

1   23.   The television as claimed in claim 22 wherein the input device is a wireless
2   remote control device.

1   24.   The television as claimed in claim 18 wherein the video information includes
2   corresponding audio information.

1   25.   A video recording apparatus for recording and replaying video programs
2   comprising:
3   a.   a memory device for receiving and storing a video stream of data;
4   b.   a transmitting circuit coupled to the memory device and to receive a video
5   stream of data to be recorded for transmitting the video stream of data to the
6   memory device when a record command is received;
7   c.   a receiving circuit coupled to the memory device, to a display and to the
8   transmitting circuit for retrieving the video stream of data from the memory
9   device when a playback command is received, wherein the memory device is
10   configured for concurrently recording and retrieving video data.

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1   26.   The video recording apparatus as claimed in claim 25 further comprising a
2   display for displaying the video stream of data when the video stream of data is retrieved by
3   the receiving circuit.

1   27.   The video recording apparatus as claimed in claim 25 wherein the transmitting
2   circuit is an IEEE 1394 serial bus interface circuit.

1   28.   The video recording apparatus as claimed in claim 25 wherein the record and
2   playback commands are received from an input device.

1   29.   The video recording apparatus as claimed in claim 28 wherein the input device
2   is a wireless remote control device.

1   30.   The video recording apparatus as claimed in claim 25 wherein the memory
2   device is a hard disk drive.

1   31.   The video recording apparatus as claimed in claim 30 wherein the transmitting
2   circuit is an IEEE 1394 serial bus interface circuit.

1   32.   The video recording apparatus as claimed in claim 31 wherein an isochronous
2   channel is used to transmit the video stream of data between the transmitting circuit and the
3   · memory device.

1   33.   The video recording apparatus as claimed in claim 25 wherein the transmitting
2   circuit and the receiving circuit are included within a transceiver circuit.

1	34.		A television for recording and playing video streams of data comprising:
2		a.	a display for displaying video information; and
3		b.	a communications circuit coupled to receive a video stream of data and
4			configured for coupling to a memory device for transmitting the video stream
5			of data to the memory device for storing the video stream of data within the
6			memory device and receiving a stored video stream of data from the memory
7			device when a playback command is received, wherein the communications
8			circuit is configured for concurrently of transmitting and receiving video data.

1   35.   The television as claimed in claim 34 wherein the memory device is external to
2 the television and the communications circuit is an IEEE 1394 serial bus interface circuit.

1   36.   The television as claimed in claim 34 wherein the memory device is internal to
2 the television.

1   37.   The television as claimed in claim 34 further comprising an input device for
2 sending the record and playback commands.

1   38.   The television as claimed in claim 37 wherein the input device is a wireless
2 remote control device.

1   39.   The television as claimed in claim 34 wherein the time period is a clock cycle.

1	40.		A method of recording and replaying video streams of data comprising the
2	steps of:		
3		a.	receiving a stream of video data to be recorded;
4		b.	transmitting the stream of video data to a memory storage device;
5		c.	storing the stream of video data within the memory storage device;

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6   d.   receiving a command to playback a previously recorded stream of video data;
7   and
8   e.   retrieving the previously recorded stream of video data from the memory
9   storage device;
10   wherein the steps of transmitting and retrieving are performed concurrently during a same
11   time period when a stream of video data is to be recorded while a previously recorded stream
12   of video data is retrieved.

1   41.   The method as claimed in claim 40 wherein the video stream of data is
2   transmitted over an IEEE 1394 serial bus network.

1   42.   The method as claimed in claim 41 wherein the memory storage device is a
2   hard disk drive.

1   43.   The method as claimed in claim 42 wherein the record and playback
2   instructions are received from a remote control device.

1   44.   A method of editing a video stream comprising the steps of:
2   a.   receiving a video stream of images for display;
3   b.   receiving a record instruction to instantaneously record information currently
4   being displayed;
5   c.   transmitting the information currently being displayed to a memory storage
6   device; and
7   d.   storing the information within the memory storage device.

1   45.   The method as claimed in claim 44 wherein the information includes video
2   information and accompanying audio information.

1   46.   The method as claimed in claim 45 wherein the video information is
2   transmitted in a digital format.

1   47.   The method as claimed in claim 44 further comprising the steps of:
2   a.   receiving a playback instruction to playback previously stored information;
3   b.   retrieving the information from the memory storage device; and
4   c.   displaying the information for further editing.

1   48.   The method as claimed in claim 47 further comprising the step of transmitting
2   the information from the memory storage device to a video recording device.

1   49.   The method as claimed in claim 48 wherein the information is transmitted over
2   an IEEE 1394 serial bus network.

1   50.   The method as claimed in claim 49 wherein the memory storage device is a
2   hard disk drive.

1   51.   The method as claimed in claim 50 wherein the video information is
2   transmitted and recorded in a digital format.

1   52.   The method as claimed in claim 47 wherein the record and playback
2   instructions are received from a remote control device.

1   53.   An apparatus for editing a video stream comprising:
2   a.   a display for displaying a video stream of images;
3   b.   a transmitting circuit coupled to receive the information currently being
4   displayed for transmitting the information when a record command is received;

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5   c.   a memory device coupled to the transmitting circuit for receiving and storing

6   the information transmitted from the transmitting circuit;

7   d.   a receiving circuit coupled to the memory device, to the display and to the

8   transmitting circuit for retrieving the information from the memory device

9   when a playback command is received, and sending the information to the

10   display for editing.

1   54.   The apparatus as claimed in claim 53 wherein the transmitting circuit is

2 configured to transmit the information to a video recording device.

1   55.   The apparatus as claimed in claim 54 wherein the transmitting circuit is an

2 IEEE 1394 serial bus interface circuit.

1   56.   The apparatus as claimed in claim 53 wherein the record and playback

2 commands are received from an input device.

1   57.   The apparatus as claimed in claim 56 wherein the input device is a wireless

2 remote control device.

1   58.   The apparatus as claimed in claim 53 wherein the information includes video

2 and accompanying audio information.

1   59.   The apparatus as claimed in claim 53 wherein the memory device and the

2 display are included within a television.

1   60.   The apparatus as claimed in claim 53 wherein the memory device is a hard disk

2 drive.

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61. A television for editing a video stream currently being displayed comprising:

a. a display for displaying video information;

b. a capturing circuit for capturing information currently being displayed when a record command is received; and

c. a communications circuit coupled to the capturing circuit and configured for coupling to a memory device for transmitting the information to the memory device for storing within the memory device and subsequently receiving the information from the memory device when a playback command is received and further wherein the communications circuit is also configured for transmitting the information to a video recording device.

62. The television as claimed in claim 61 wherein the memory device is external to the television and the communications circuit is an IEEE 1394 serial bus interface circuit.

63. The television as claimed in claim 61 wherein the memory device is internal to the television.

64. The television as claimed in claim 61 further comprising an input device for sending the record and playback commands.

65. The television as claimed in claim 64 wherein the input device is a wireless remote control device.

66. The television as claimed in claim 61 wherein the information includes video and accompanying audio information.

67.   A method of instantaneously capturing video images substantially as hereinbefore described with reference to and as illustrated by the accompanying drawings.

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68.   An apparatus for instantaneously capturing video images constructed and arranged substantially as hereinbefore described with reference to and as illustrated by the accompanying drawings.

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69.   A television for displaying video information and capturing and storing video information currently being displayed constructed and arranged substantially as hereinbefore described with reference to and as

15   illustrated by the accompanying drawings.

70.   A video recording apparatus constructed and arranged substantially as hereinbefore described with reference to and as illustrated by the accompanying

20   drawings.

71.   A television for recording and playing video streams constructed and arranged substantially as hereinbefore described with reference to and as

25   illustrated by the accompanying drawings.

72.   A method of recording and replaying video streams of data substantially as hereinbefore described with reference to and as illustrated by the accompanying

30   drawings.

73.   A method of editing a video stream substantially as hereinbefore described with reference to and as illustrated by the accompanying drawings.

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74.   An apparatus for editing a video stream
constructed and arranged substantially as hereinbefore
described with reference to and as illustrated by the
accompanying drawings.

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75.   A television for editing a video stream
currently being displayed constructed and arranged
substantially as hereinbefore described with reference to
and as illustrated by the accompanying drawings.

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The Patent Office

Application No: GB 9820939.8   **Examiner:** Julyan Elbro

Claims searched: 1 to 75   **Date of search:** 6 January 1999

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): G5R (RHD, RHX, RB81); H4F (FKX)

Int Cl (Ed.6): G11B 27/028, 27/10

Other: ONLINE: WPI JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
P, X	GB 2320389 A	DICKINSON see abstract and pages 7 and 8.	1-66
X	GB 2273220 A	QUANTEL see abstract.	1-24, 44-66
X	GB 2222742 A	HASHIMOTO see abstract and page 7 line 20 to page 8 line 11.	1-66
P, X	EP 0866446 A2	TOSHIBA see fig 1, page 1 lines 3-5, and page 2 lines 8-15	1-66
X	EP 0610042 A2	PIONEER ELECTRONIC see abstract.	1-24, 44-66
X	WO 95/21506 A2	DAN'L SYSTEMS see abstract.	1-24, 44-66
X	WO 94/11995 A1	DUBNER et al. See abstract.	1-24, 44-66
X	US 5598208 A	McCLINTOCK see column 3 lines 4-9 and column 6 lines 5-23.	1-24, 44-66
X	US 5140435 A	SUZUKI et al. See abstract.	1-24, 44-66

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Category	Identity of document and relevant passage	Relevant to claims
X	PAJ abstract number 08315500 CD Serial Number 9611 & JP 08315500 A (HITACHI) see abstract.	1-66
X	PAJ abstract number 08255464 CD Serial Number 9610 & JP 08255464 A (SONY) see abstract.	1-66

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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